

LBYCV3B – Construction Materials and Testing Laboratory

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Experiment No. 1 Total Evaporable Moisture Content of aggregate by Drying

I. Introduction

Moisture content is the absorbed water as aggregates have voids that are either filled with water or air, (Pavementinteractive.org, n.d.). In the experiment, it determines the moisture content, in terms of water, in the aggregates which are gravel and sand using the guidance of the standard method under ASTM C566. Consequently, the aggregates were oven-dry (OD) implicating that the moisture was thoroughly removed from it.

With that, the experiment aims the following objectives:

- To determine the total evaporable moisture content of the given aggregate, primarily gravel and sand;
- To compare and differentiate the moisture content of gravel and sand aggregate; and
- To discover learnings observed in the experiment, more specifically in the field of engineering.

II. Procedure

The following steps are conducted in the experiment:

- Selecting the proper sample container that cannot be affected by heat and has adequate volume to contain the selected sample without the danger of spilling.
- Measuring the weight of the container and the weight of both the sample and container to the nearest 0.1% to have an accurate reading.

- Using a ventilated oven capable of maintaining a uniform temperature of $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$) to dry the soil sample thoroughly. Be thoroughly careful in handling the container with the sample to avoid any loss of particles.
- Determining if the sample is thoroughly dry when the sample experiences a decrease of less than 0.1% to its total mass.
- Measuring the weight of the cooled dried sample to the nearest 0.1% to determine the moisture content of the specific sample.
- The experiment is then repeated once more for the other selected sample.

III. Data

Table 1: Data sheet for Gravel Aggregate

Test No.	1
1. Container No.	gravel
2. Weight of Container, g	383.20
3. Weight of Sample + Container, g	4,170.50
4. Weight of Sample: $W = [3] - [2]$, g	3,787.30
5. Weight of Oven-Dried Sample + Container, g	4,121.90
6. Weight of Oven-Dried Sample: $D = [5] - [2]$, g	3,738.70
7. $p = 100 \times \{[4] - [6]\} / [6]$, %	1.30
8. Average Moisture Content, %	1.30

Table 2: Data sheet for Sand Aggregate

Test No.	1
1. Container No.	sand
2. Weight of Container, g	201.10
3. Weight of Sample + Container, g	702.80
4. Weight of Sample: $W = [3] - [2]$, g	501.70
5. Weight of Oven-Dried Sample + Container, g	691.70
6. Weight of Oven-Dried Sample: $D = [5] - [2]$, g	490.60
7. $p = 100 \times \{[4] - [6]\} / [6]$, %	2.26
8. Average Moisture Content, %	2.26

Calculations:

Gravel:

$$\text{Weight of Sample} = 4,170.50 - 383.20 = 3,787.30 \text{ g}$$

$$\begin{aligned}\text{Weight of Oven-Dried Sample} &= 4,121.90 - 383.20 = 3,738.70 \text{ g} \\ \text{Total Evaporable Moisture content} &= 100 \times \{3,787.30 - 3,738.70\} / 3,738.70 \\ &= 1.30 \%\end{aligned}$$

Sand:

$$\begin{aligned}\text{Weight of Sample} &= 702.80 - 201.10 = 501.70 \text{ g} \\ \text{Weight of Oven-Dried Sample} &= 691.70 - 201.10 = 490.60 \text{ g} \\ \text{Total Evaporable Moisture content} &= 100 \times \{501.70 - 490.60\} / 490.60 = \\ &2.26 \%\end{aligned}$$

IV. Conclusions

Based on Table 1 and 2, the moisture content of the gravel aggregate is around 1.30%, while the moisture content of the sand aggregate is approximately 2.26%. It can be observed that the moisture content for sand aggregate is higher than gravel aggregate implying a sand aggregate has a higher void ratio and porosity. With that, fine aggregate can withhold more moisture than coarse aggregate. Fine aggregates that have the higher moisture content, have greater compaction, which would lead to lower permeability. Although when the moisture content in a certain soil is high, its shear strength and bearing capacity is quite low, since the moisture would partially fill the voids existing in the soil. In short, any change or difference in the moisture content of a soil also affects the various properties of the said soil. Determining the moisture content of a specific soil sample is necessary as it could determine whether the usage of the said soil is suitable for certain locations and environments and whether the soil structure is stabilized or not.

V. Things Learned from the Experiment

From the experiment, sand and gravel aggregates cannot only be differentiated from their size but also in their other properties particularly its moisture content. It has been learned that sand aggregates have a higher moisture content when compared to gravel aggregates since sand has a higher void ratio and porosity than gravel. The effects of the moisture content in the aggregates were also learned. A higher moisture content will lead to a weaker soil. The moisture content of the sample found would be significant enough to have an effect on the quality of the concrete created. Finding out the moisture content of the aggregates would save the time it would take to iterate the mix designs so that a correct mix design would be found. Even though this experiment is easy to scoff off as an easy one, it is nevertheless essential because it reinforced the valuable skills that are fundamental to future experiments such as how to weigh samples, how to handle samples and how to operate the oven.

VI. References

Pavementinteractive.org. (n.d.). *Moisture Content*. Retrieved from
<https://pavementinteractive.org/reference-desk/materials/aggregate/moisture-content/>